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of this new form, as compared with the long-known forms, are the simple microsporophylls and sessile ovules. The author concludes that there is no evidence of any connection between Bennettitales and angiosperms.—J. M. C.

Atmometry and the porous cup.—With the increasing attention now being given to the quantitative determination of ecological factors, it is fortunate to have the technique of one of the most fruitful fields of investigation reviewed and summarized by the worker most prominently connected with it from the beginning. Such a review of the instruments and methods of measuring the evaporating power of the air by LIVINGSTON³² has recently appeared, including descriptions of the various forms of atmometers and their operation and standardization. Prominent among the recent improvements in this field is the rotating table for standardizing the porous cups, already noted in this journal,³³ and the improved form of the non-absorbing porous atmometer devised by SHIVE³⁴ to provide against errors caused by the absorption of water by the atmometer during rainfall. The various difficulties encountered by LIVINGSTON and other workers during the ten years since he invented the present form of porous cups are discussed in a way that makes the work invaluable to all workers in this field.—GEO. D. FULLER.

Evaporation in a marsh.—In a marsh upon the borders of Lake Erie, where zonation was well marked, SEARS³⁵ has measured the rate of evaporation in the different associations for a period of four weeks following June 29, and found the highest rate above the open water in the *Scirpus* association, with the lowest in one dominated by *Calamagrostis canadensis*. The comparative values for associations dominated by *Calamagrostis*, *Typha*, *Phragmites*, *Pontederia*, *Sparganium*, *Castalia*, and *Scirpus* are correspondingly 100, 102, 113, 125, 137, 343, and 413. It is to be regretted that the observations did not extend over a longer period, and that SEARS has not reduced his results to the unit commonly used by other workers in this field, that is, to loss per day from the standard atmometer. However, it is an important addition to the data now gradually accumulating of the evaporating power of the air in various habitats.—GEO. D. FULLER.

Rachiopteris.—Miss BANCROFT³⁶ describes a large amount of material from various sources, which is referred to *Rachiopteris cylindrica*. Two types

³² LIVINGSTON, B. E., Atmometry and the porous cup. *Plant World* 18:21-30, 51-74, 95-111, 143-149. 1915.

³³ BOT. GAZ. 55:263. 1913.

³⁴ SHIVE, J. W., An improved non-absorbing porous cup atmometer. *Plant World* 18:7-10. 1915.

³⁵ SEARS, P. B., Evaporation and plant zones in the Cedar Point marsh. *Ohio Jour. Sci.* 16:91-100. *figs.* 5. 1916.

³⁶ BANCROFT, N., Contributions to our knowledge of *Rachiopteris cylindrica* Will. *Ann. Botany* 29:531-565. *pls.* 26, 27. 1915.

of branches, the *alpha* type and the *beta* type, are noted. The former are more vigorous, and the latter slender and with a lacunar cortex. The author connects these types with one another as part of the same individual, regarding the slender ramifications as possibly adapted to aquatic conditions. The organization of the vascular tissues is protostelic, characterized as exhibiting a central core of small, entirely tracheary tissue surrounded by an envelope of larger elements of the xylem. The author calls attention to the support furnished by *Rachiopteris* for the hypothesis put forward by BOWER, POTONIÉ, and others, for the branchlike origin of the leaf in ferns and their allies.—E. C. JEFFREY.

The grass embryo.—SARGANT and ARBER,³⁷ studying seedlings, and embryos of grasses at the dormant stage, find many variants within the family, which can be satisfactorily accounted for by deriving them from a hypothetical form. This imaginary form they designate as *X*, and the relationships of the various embryos and seedlings are worked out with much ingenuity. The reviewer believes that the problem of the actual relations of monocotyledons to each other and also to the dicotyledons will not be solved by erecting a hypothetical form, but that real progress can be made by a critical study of the earlier stages of the embryo, extending from the fertilized egg to the dormant stage of the embryo. A study of the literature of the subject shows how little is actually known of early embryogeny in angiosperms.—W. J. G. LAND.

Medullary phloem.—A recent paper by WORSDELL³⁸ is of considerable interest because it involves the deliberate application of general anatomical principles derived from the study of the gymnosperms, living and extinct, to the elucidation of the anatomical structure of the dicotyledons. Its author, as a result of a sojourn in South Africa, became possessed with a large amount of material of the Cucurbitaceae, a group well developed in this geographic region. He finds good reason for concluding from the study of the conservative peduncular and petiolar regions that internal phloem, a feature of the family, is not a primitive characteristic, but results from the fusion of inverted medullary strands with the inner surface of a normal cycle of bundles. Further studies from the same quarter will be awaited with interest.—E. C. JEFFREY.

Potamogeton.—While the economic aspect of the growth of various species of *Potamogeton* in ponds has been the prime object of investigation, Miss MOORE³⁹ has presented valuable data upon the habits of growth and reproduc-

³⁷ SARGANT, ETHEL, and ARBER, AGNES, The comparative morphology of the embryo and seedling in the Gramineae. Ann. Botany **29**:161-222. figs. 35. pls. 9, 10. 1915.

³⁸ WORSDELL, W. C., The origin and meaning of medullary (intraxylary) phloem in the stems of dicotyledons. I. Cucurbitaceae. Ann. Botany **29**:567-590. figs. 10. 1915.

³⁹ MOORE, EMMELINE, The Potamogetons in relation to pond culture. Bull. Bur. Fisheries **33**:255-291. pls. 22-39. 1915.